CLAIMS

We claim:

1. A process for recovering heat from a high temperature effluent stream from catalyst regeneration or the like, wherein the process comprises the steps of:

   (a) passing the effluent stream through a heat exchanger associated with a steam generator fed with boiler feed water to produce high pressure steam and partially cool the effluent stream;

   (b) passing the partially cooled effluent stream through a heat exchanger associated with a high pressure boiler feed water preheater to provide preheated boiler feed water and further cool the effluent stream; and

   (c) passing the preheated boiler feed water to the steam generator.

2. The process of claim 1, wherein the high temperature effluent stream has a temperature of at least about 650°C, the partially cooled effluent stream has a temperature not greater than about 262°C, and the further cooled effluent stream has a temperature not greater than about 127°C.

3. The process of claim 1, wherein the high temperature effluent stream has a temperature ranging from about 650° to about 730°C, the partially cooled effluent stream has a temperature ranging from about 232° to about 343°C, and the further cooled effluent stream has a temperature ranging from about 116° to about 204°C.

4. The process of claim 1, wherein the high temperature effluent stream has a temperature ranging from about 652° to about 691°C, the partially cooled effluent stream has a temperature ranging from about 260 to about 316°C, and the further cooled effluent stream has a temperature ranging from about 127° to about 160°C.

5. The process of claim 1, wherein the preheated boiler feed water has a pressure of at least about 4240 kPaa, and a temperature of at least about 150°C.

6. The process of claim 1, wherein the preheated boiler feed water has a pressure ranging from about 4240 to about 7688 kPaa, and a temperature ranging from about 150° to about 293°C.

7. The process of claim 1, wherein the preheated boiler feed water has a pressure ranging from about 4240 to about 6309 kPaa, and a temperature ranging from about 150° to about 277°C.

8. The process of claim 1, wherein the further cooled effluent stream contains catalyst fines and is directed to a catalyst fines removal unit for removal of the catalyst fines.

9. The process of claim 8, wherein the catalyst fines removal unit is selected from the group consisting of: an electrostatic precipitator, a wet electrostatic precipitator, a cyclone separator or other inertial separation device, a filter, a baghouse and a wet gas scrubber.

10. The process of claim 9, wherein the effluent stream is passed from the catalyst fines removal unit to a flue gas stack for disposal in ambient atmosphere.

11. The process of claim 1, wherein the high temperature effluent stream contains catalyst fines and is directed to a catalyst fines removal unit before step (a) for removal of the catalyst fines.

12. The process of claim 11, wherein the catalyst fines removal unit is selected from the group consisting of: a cyclone separator or other inertial separation device, a metal filter and a ceramic filter.

13. The process of claim 1, wherein the partially cooled effluent stream contains catalyst fines and is directed to a catalyst fines removal unit for removal of the catalyst fines.

14. The process of claim 13, wherein the catalyst fines removal unit is selected from the group consisting of: an electrostatic precipitator, a cyclone separator or other inertial separation device, and a filter.

15. The process of claim 1, wherein the preheated boiler feed water and the high pressure steam from the steam generator are mixed in a steam drum and liquid boiler feed water is passed from the steam drum to the steam generator.

16. The process of claim 15, wherein high pressure steam is taken from the steam drum.

17. The process of claim 1, wherein the high temperature effluent stream is taken from a catalyst regenerator of a fluidized catalytic cracker.

18. The process of claim 1, wherein the high temperature effluent stream is taken from a catalyst regenerator associated with an oxygenate to olefins reactor.

19. The process of claim 1, wherein the high temperature effluent stream is taken from a catalyst regenerator associated with a methanol to olefins reactor.

20. The process of claim 1, wherein the steam generator and the preheater are located within a common enclosure.

21. An apparatus for recovering heat from a catalytic reactor system, comprising:

(a) a catalyst regenerator having an outlet for hot flue gas;

(b) a steam generator comprising a first indirect heat exchanger operatively connected to receive hot flue gas from the catalyst regenerator and a supply of high pressure liquid boiler feed water;

(c) a boiler feed water preheater comprising a second indirect heat exchanger connected to receive the boiler feed water and operatively connected to receive partially cooled flue gas from the steam generator;

(d) conduit means for passing preheated high pressure boiler feed water from the preheater to the steam generator; and

(e) means for recovering high pressure steam from the steam generator.

22. The apparatus of claim 21, further comprising:

(a) a steam drum operatively connected to receive the preheated boiler feed water and high pressure steam for mixing in the steam drum, and conduit means for passing liquid boiler feed water from the steam drum to the steam generator.

23. The apparatus of claim 22, further comprising:

(a) a conduit means for passing high pressure steam from the steam drum.

24. The apparatus of claim 21, wherein the steam generator and the preheater are located within a common enclosure.

25. A process for catalytic conversion using a molecular sieve catalyst which accumulates carbonaceous deposit during operation of a catalytic reactor,

wherein the carbonaceous deposit is removed in a high temperature regenerator unit with a regeneration medium, the process comprising the steps of:

(a) passing a high temperature effluent stream containing catalyst fines from the regenerator unit to a heat exchanger associated with a steam generator fed with boiler feed water, to produce high pressure steam and a partially cooled effluent stream;

(b) passing the partially cooled effluent stream to a heat exchanger associated with a high pressure boiler feed water preheater to further cool the effluent stream; and

(c) further treating the effluent stream to remove the catalyst fines.

26. A process for catalytic conversion using a molecular sieve catalyst which accumulates carbonaceous deposit during operation of a catalytic reactor, wherein the carbonaceous deposit is removed in a high temperature regenerator unit with a regeneration medium, the process comprising the steps of:

(a) passing a high temperature effluent stream from the regenerator unit to a heat exchanger associated with a steam generator fed with boiler feed water, to produce high pressure steam and a partially cooled effluent stream;

(b) passing the partially cooled effluent stream to a heat exchanger associated with a high pressure boiler feed water preheater to provide preheated boiler feed water and further cooled effluent stream;

(c) passing the preheated boiler feed water and the high pressure steam from the steam generator to a steam drum for direct contact and mixing;

(d) recovering high pressure steam from the steam drum; and

(e) passing liquid boiler feed water from the steam drum to the steam generator, thereby providing efficient recovery of thermal value.

27. The process of claim 26, wherein the further cooled effluent stream contains catalyst fines and is passed to a catalyst fines removal unit for removal of the catalyst fines.

28. The process of claim 27, wherein the catalyst fines removal unit is selected from the group consisting of: an electrostatic precipitator, a wet electrostatic precipitator, a cyclone separator or other inertial separation device, a filter, a baghouse and a wet gas scrubber.

29. The process of claim 27, wherein the catalyst fines comprise particles whose largest particle dimension is less than about 100 microns.

30. The process of claim 27, wherein the catalyst fines comprise particles whose largest particle dimension is less than about 60 microns.

31. The process of claim 27, wherein the effluent stream is passed from the catalyst fines removal unit to a flue gas stack for disposal in ambient atmosphere.

32. The process of claim 26, wherein the high temperature effluent stream has a temperature of at least about 650°C, the partially cooled effluent stream has a temperature not greater than about 262°C, and the further cooled effluent stream has a temperature not greater than about 127°C.

33. The process of claim 26, wherein the high temperature effluent stream has a temperature ranging from about 650° to about 730°C, the partially cooled effluent stream has a temperature ranging from about 232° to about 343°C, and the further cooled effluent stream has a temperature ranging from about 116° to about 204°C.

34. The process of claim 26, wherein the high temperature effluent stream has a temperature ranging from about 652° to about 691°C, the partially cooled effluent stream has a temperature ranging from about 260 to about 316°C, and the further cooled effluent stream has a temperature ranging from about 127° to about 160°C.

35. The process of claim 26, wherein the preheated boiler feed water has a pressure of at least about 4240 kPaa, and a temperature of at least about 150°C.

36. The process of claim 26, wherein the preheated boiler feed water has a pressure ranging from about 4240 to about 7688 kPaa, and a temperature ranging from about 150° to about 293°C.

37. The process of claim 26 wherein the preheated boiler feed water has a pressure ranging from about 4240 to about 6309 kPaa, and a temperature ranging from about 150° to about 277°C.

38. The process of claim 26, wherein the preheated boiler feed water and the high pressure steam from the steam generator are mixed in a steam drum and liquid boiler feed water is passed from the steam drum to the steam generator.

39. The process of claim 38, wherein high pressure steam is taken from the steam drum.

40. The process of claim 26, wherein the high temperature effluent stream is taken from a catalyst regenerator of a fluidized catalytic cracker.

41. The process of claim 26, wherein the high temperature effluent stream is taken from a catalyst regenerator associated with an oxygenate to olefins reactor.

42. The process of claim 26, wherein the high temperature effluent stream is taken from a catalyst regenerator associated with a methanol to olefins reactor.

43. The process of claim 42, wherein the catalyst comprises SAPO-34.

44. The process of claim 26, wherein the steam generator and the preheater are located within a common enclosure.

45. The process of claim 26, wherein the partially cooled effluent stream has been cooled to no less than about 249°C, and the further cooled effluent stream has been cooled to at least 25°C less than the partially cooled effluent stream temperature.

46. The process of claim 26, wherein the partially cooled effluent stream has been cooled to no less than about 277°C, and the further cooled effluent stream has been cooled to at least 25°C less than the partially cooled effluent stream temperature.